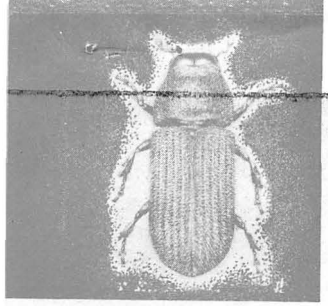
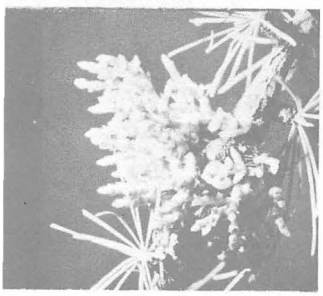
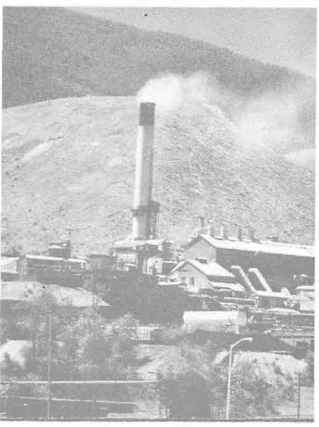
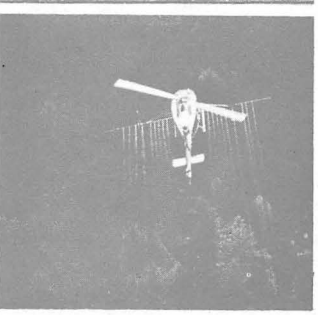

FOREST INSECT & DISEASE MANAGEMENT

USDA • FOREST SERVICE • NORTHERN REGION

State & Private Forestry • Missoula, MT 59801

Report No. 79-13

3450
June 1979

DWARF MISTLETOE LOSS ASSESSMENT IN EAST SIDE NORTHERN REGION NATIONAL FORESTS

by

Oscar J. Dooling, Plant Pathologist

ABSTRACT

We conducted a combination road/plot impact survey for dwarf mistletoe in lodgepole pine on six East Side National Forests in 1978. The road survey showed infestation percentages ranging from 28.2 on the Custer to 52.4 on the Beaverhead. The plot survey showed annual cubic foot volume losses ranging from 106M on the Custer to nearly 2.5MM on the Deerlodge. These losses are significant.

INTRODUCTION

We surveyed six East Side National Forests (figure 1) in 1978 to help us estimate incidence and cubic foot volume loss due to lodgepole pine dwarf mistletoe (Arceuthobium americanum Nutt. ex Engelm.). Mistletoe data from the current timber inventory system runs from inadequate to nonexistent. Our intent was to provide the land manager better information for use in decisionmaking.

OBJECTIVES

Our objectives were to determine distribution and intensity of and cubic foot volume loss due to dwarf mistletoe on lodgepole pine on the Beaverhead, Custer, Deerlodge, Gallatin, Helena, and Lewis & Clark National Forests in central Montana.

METHODS

Our survey was based on a combination road/plot system developed by Drummond (1978). Three two-person crews drove all passable roads through the lodgepole pine type at speeds less than 10 miles per hour. The crews observed a one-chain wide strip on the right side of the road and recorded mileage to the nearest 0.1 mile where there was a change in type, size class, or dwarf mistletoe infection intensity. These terms are defined as:

Lodgepole pine type -

More than 50 percent of stand is lodgepole pine.

Size class -

Seedling/Sapling = trees <4.9 inches dbh

Pole = trees 5.0 to 8.9 inches dbh

Mature = trees >9.0 inches dbh

Infection intensity -

0 = no infection

1 = <1/3 of the trees infected

2 = 1/3 to 2/3 of the trees infected

3 = >2/3 of the trees infected.

The crews also established variable radius plots (BAF 10) at 3-mile intervals, normally placed two chains into the stand on the right side of the road. If that direction was nontype, the plot was placed on the left side of the road. If both sides were nontype, that fact was recorded and the plot discarded without replacement. The crews recorded dbh, height, and dwarf mistletoe rating (DMR) on the six class system (Hawksworth 1977) for all lodgepole pine >4

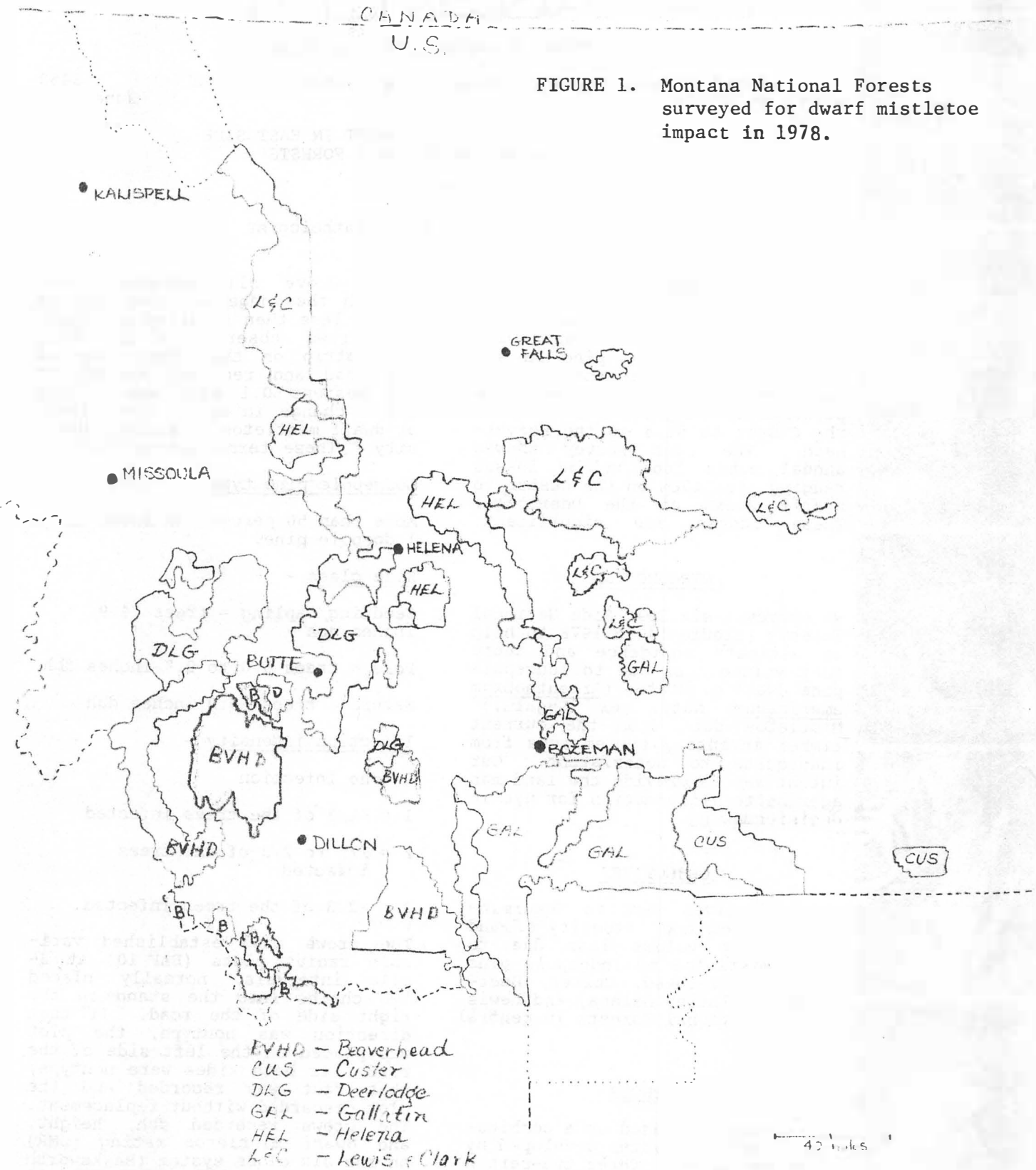

FIGURE 1. Montana National Forests surveyed for dwarf mistletoe impact in 1978.

FIGURE 2. An example of original plot data summarized on the MAG Tektronix

DATA FOR THE LEWIS AND CLARK TO BE RUN ON RMYLD

PLOT	SITE	AGE	CAL. DBH	HT	DEN	DMR	AGE +20	AGE +10	#TR/ POINT	ACT. DBH
136	74	50	7.9	47.4	499	0.0	70	60	17	7.9
140	72	75	10.6	61.7	131	0.0	95	85	8	10.6
141	52	110	11.3	44.2	86	2.8	130	120	6	11.3
143	52	170	11.5	61.8	152	4.0	190	180	11	11.5
152	61	43	9.8	35.0	95	0.0	63	53	5	9.8
155	66	70	10.6	53.7	147	0.0	90	80	9	10.6
161	52	160	9.6	53.1	159	4.7	180	170	8	9.6
164	52	15	4.4	17.5	189	0.0	35	25	2	4.4
166	52	140	9.9	40.5	112	3.8	160	150	6	9.9
168	40	200	10.5	56.1	233	1.6	220	210	14	10.5
170	52	15	4.6	20.0	87	0.0	35	25	1	4.6
171	54	105	11.3	55.7	57	0.0	125	115	4	11.3
172	65	70	9.0	52.9	158	0.0	90	80	7	9.0
184	52	200	10.5	56.3	67	6.0	220	210	4	10.5
187	72	90	11.9	68.0	117	0.0	110	100	9	11.9
188	60	80	11.0	53.5	167	0.0	100	90	11	11.0
190	74	80	9.4	65.5	83	0.5	100	90	4	9.4
191	43	100	5.8	42.6	818	0.0	120	110	15	5.8
192	72	80	9.3	63.7	318	0.0	100	90	15	9.3
1138	79	60	7.4	58.3	335	0.4	80	70	10	7.4
1140	70	60	8.4	51.2	312	0.0	80	70	12	8.4
1142	49	110	6.5	51.4	651	0.0	130	120	15	6.5
1145	55	90	7.1	52.0	364	0.4	110	100	10	7.1
1158	39	210	13.1	55.0	75	0.1	230	220	7	13.1
1164	52	16	4.2	17.0	104	0.0	36	26	1	4.2

YIELDS PER ACRE OF LODGEPOLE PINE

PLOT NUMBER 296

SITE INDEX, 57 FT. 0-YEAR THINNING INTERVAL
THINNING INTENSITY-- INITIAL- .0 SUBSEQUENT- .0

CHARACTERISTICS BEFORE AND AFTER THINNING

STAND AGE YEARS	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MAI	MERCH. VOLUME CU.FT.	MAI	SAWTIMBER VOLUME BD.FT.
200	.0	126	30	6.6	43	650	3	450	2	0
210	.0	122	42	7.9	44	920	4	800	4	0

PERIODIC INTERMEDIATE CUTS

TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	TOTAL VOLUME CU.FT.	MERCH. VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	MERCH. CU.FT. SUBSAWLOG
TOTAL YIELDS			920	800	0	800

MERCH. CU. FT. - TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.
BD. FT. - TREES 6.5 INCHES D.B.H. AND LARGER TO 6.0-INCH TOP.
MINIMUM REMOVALS FOR INCLUSION IN TOTAL YIELDS--
0. CUBIC FEET AND 0. BOARD FEET PER ACRE.
INITIAL THINNING FROM ABOVE ALLOWED IN STANDS WITH DWARF MISTLETOE.
D.M.R. ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED - 3.0.
NO NONCOMMERCIAL THINNINGS ALLOWED.
CULMINATION OF M.A.I. MERCH. CU. FT.--AGE= 210 MAI= 4.
CULMINATION OF M.A.I. TOTAL CU. FT.--AGE= 210 MAI= 4.

FIGURE 4.--SIMULATED YIELD TABLE, DWARF MISTLETOE-FREE PLOT FROM THE BEAVERHEAD NATIONAL FOREST.

IELDS PER ACRE OF LODGEPOLE PINE

LOT NUMBER 296

ITE INDEX, 57 FT. 0-YEAR THINNING INTERVAL
HINNING INTENSITY-- INITIAL- .0 SUBSEQUENT- .0

		CHARACTERISTICS BEFORE AND AFTER THINNING								PERIODIC INTERMEDIATE CUTS						
STAND AGE YEARS	DMR	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FT.	TOTAL VOLUME CU.FT.	MAI	MERCH. VOLUME CU.FT.	MAI	SAWTIMBER VOLUME BD.FT.	TREES NO.	BASAL AREA SQ.FT.	AVERAGE D.B.H. IN.	TOTAL VOLUME CU.FT.	MERCH. VOLUME CU.FT.	SAWTIMBER VOLUME BD.FT.	MERCH. CU.FT. SUBSAWLOG
200	3.7	126	30	6.6	43	650	3	450	2	0							
210	4.4	117	40	7.9	44	880	4	760	4	0							
						230*											
											TOTAL YIELDS			880	760	0	760

MERCH. CU. FT. - TREES 6.0 INCHES D.B.H. AND LARGER TO 4.0-INCH TOP.
BD. FT. - TREES 6.5 INCHES D.B.H. AND LARGER TO 6.0-INCH TOP.
MINIMUM REMOVALS FOR INCLUSION IN TOTAL YIELDS--
0. CUBIC FEET AND 0. BOARD FEET PER ACRE.
INITIAL THINNING FROM ABOVE ALLOWED IN STANDS WITH DWARF MISTLETOE.
D.M.R. ABOVE WHICH PERIODIC THINNINGS WILL NOT BE EXECUTED - 3.0.
NO NONCOMMERCIAL THINNINGS ALLOWED.
CULMINATION OF M.A.I. MERCH. CU. FT.--AGE= 210 MAI= 4.
CULMINATION OF M.A.I. TOTAL CU. FT.--AGE= 210 MAI= 4.

*Increased growth in 10 years.

FIGURE 3.--SIMULATED YIELD TABLE, DWARF MISTLETOE INFESTED PLOT FROM THE BEAVERHEAD NATIONAL FOREST.

inches dbh. One representative tree on each plot was aged from an increment core for site index calculations.

We used the road data to estimate the proportion of lodgepole pine type infested by determining the ratio of miles with infected trees present to the total miles of type. We used the plot data to relate cubic foot volume loss to dwarf mistletoe incidence. We first summarized the plot data using a Tektronix® desk-top microprocessor at Forest Insect and Disease Management/Methods Application Group (FI&DM/MAG), Davis, CA; then ran the data through a simulated yield program, RMYLD (Edminster 1978), on the Univac® 1110 at Fort Collins, CO.

RESULTS AND DISCUSSION

Road survey.--Road data are summarized in table 1. Dwarf mistletoe infestation percentage was calculated from table 1:

$$\text{Infestation percentage} = \frac{\text{Miles severity categories 1+2+3}}{\text{type miles}} X100$$

Infestation percentages are:

Beaverhead	52.4
Custer	28.2
Deerlodge	46.6
Gallatin	42.0
Helena	35.4
Lewis & Clark	36.6

Plot survey.--Figure 2 is an example of the original field data summarized on the MAG Tektronix®. These figures were then used to drive RMYLD to produce a simulated yield table for each plot. RMYLD calculates the impact of dwarf mistletoe in arriving at volume predictions. A subroutine on a second run suppressess all infection data and tables are produced as though infection were not present. The difference between the two tables is then taken as the 10-year impact of dwarf mistletoe. Yield tables for one of the Beaverhead plots are shown in figures 3, infested, and 4, noninfested, as illustration. Loss data was summarized from the pairs of yield tables for each plot as cubic foot per acre per year volume loss by DMR class. The summaries are appendices A through E. Volume loss of dwarf mistletoe by DMR for all East Side Forests is shown in table 2. A more concise summary of volume loss is shown in table 3.

None of the Custer plots were infested. All volume loss calculations for the Custer were made with East Side averages.

Past estimates of dwarf mistletoe impact were more nearly guesses than estimates. We consider these current estimates to be accurate within ±20 percent. Although considerably lower than previously thought, an annual loss of more than 6.7MM cubic feet on the six East Side National Forests is still a significant impact.

The land manager, with these more accurate estimates of loss, has one more bit of information to help him write his Forest management prescriptions.

Table 1.--Miles of road surveyed in East Side Northern Region lodgepole pine stands by timber size class, and dwarf mistletoe infection intensity

Dwarf mistletoe infection intensity 1/	Beaverhead Size Class 2/ SS	P	M	Total	Custer Size Class SS	P	M	Total	Deerlodge Size Class SS	P	M	Total
0	18.6	59.7	4.2	82.5	1.6	6.1	0.2	7.9	32.2	116.8	15.1	164.1
1	7.3	44.2	1.1	52.6	0.4	1.4	0	1.8	8.8	47.2	5.6	61.6
2	1.7	16.4	0.5	18.6	0	0.3	0	0.3	3.1	25.7	2.5	31.3
3	0.5	18.2	0.8	19.5	0	1.0	0	1.0	4.4	41.1	4.7	50.2
TOTALS	28.1	138.5	6.6	173.2	2.0	8.8	0.2	11.0	48.5	230.8	27.9	307.2

	Gallatin Size Class SS	P	M	Total	Helena Size Class SS	P	M	Total	Lewis & Clark Size Class SS	P	M	Total	East Side Totals
0	43.1	37.2	8.3	88.6	18.7	69.7	13.6	102.0	39.2	57.5	9.8	106.5	551.6
1	12.6	23.9	1.9	38.4	4.0	21.2	3.6	28.8	8.0	23.4	1.6	33.0	216.2
2	1.3	11.3	0.9	13.5	0.8	7.7	1.6	10.1	1.7	8.8	1.1	11.6	85.4
3	0.7	8.9	2.6	12.2	1.4	13.1	2.6	17.1	1.3	13.2	2.4	16.9	116.9
TOTALS	57.7	81.3	13.7	152.7	24.9	111.7	21.4	158.0	50.2	102.9	14.9	168.0	970.1

1/ Infection intensity:
0 - no infection
1 - <1/3 of trees infected
2 - 1/3 to 2/3 of trees infected
3 - >2/3 of trees infected

2/ Size class:
SS - seedling-sapling <4.9 inches dbh
P - pole, 5.0 to 8.9 inches dbh
M - Mature, >9.0 inches dbh

Table 2.--Acres of dwarf mistletoe infestation represented by survey plots and annual cubic-foot volume loss estimates for East Side Northern Region lodgepole pine stands by 6-class infection system

Dwarf misteltoe severity category	BEAVERHEAD No. Plots	% Rep.	M Acres	Loss Ft^3/ Acre/ Year	Total Loss Mft^3	CUSTER No. Plots	% Rep.	M Acres	Loss Ft^3/ Acre/ Year	Total Loss Mft^3	DEERLODGE No. Plots	% Rep.	M Acres	Loss Ft^3/ Acre/ Year	Total Loss Mft^3
0	47	62.7	254.9	0	0	6	100	42.4	0	0	80	61.1	294.9	0	0
0.1-1.0	8	10.7	43.5	0	0	0	*	*	*	*	18	13.7	66.2	0.2	13.2
1.1-2.0	4	5.3	21.5	0.5	10.7	0	*	*	*	*	8	6.1	29.4	0.6	17.6
2.1-3.0	8	10.7	43.5	8.9	387.1	0	*	*	*	*	10	7.6	36.7	9.0	330.3
3.1-4.0	5	6.6	26.8	9.8	262.6	0	*	*	*	*	2	1.5	7.2	16.5	118.8
4.1-5.0	3	4.0	16.3	38.7	630.8	0	*	*	*	*	9	6.9	33.3	31.9	1,062.3
5.1-6.0	0	*	*	*	*	0	*	*	*	*	4	3.1	15.0	63.8	957.0
TOTALS	75	100	406.5 1/	--	1,291.2	6	100	42.4 1/	--	0	131	100	482.7 1/	--	2,499.2

Dwarf misteltoe severity category	GALLATIN No. Plots	% Rep.	M Acres	Loss Ft^3/ Acre/ Year	Total Loss Mft^3	HELENA No. Plots	% Rep.	M Acres	Loss Ft^3/ Acre/ Year	Total Loss Mft^3	LEWIS & CLARK No. Plots	% Rep.	M Acres	Loss Ft^3/ Acre/ Year	Total Loss Mft^3
0	44	65.7	102.9	0	0	52	66.7	166.7	0	0	46	63.0	265.3	0	0
0.1-1.0	0	0	0	0	0	13	16.7	41.8	0	0	11	15.2	64.0	0	0
1.1-2.0	5	7.5	11.6	0.8	9.3	4	5.1	12.8	0	0	4	5.5	23.2	0	0
2.1-3.0	7	10.4	16.3	4.8	78.2	1	1.3	3.2	6.0	19.2	2	2.7	11.4	5.5	62.7
3.1-4.0	4	6.0	9.4	20.2	189.9	5	6.4	16.0	19.2	307.2	5	6.8	28.6	17.2	491.9
4.1-5.0	4	6.0	9.4	15.2	142.9	2	2.5	6.2	46.0	285.2	3	4.1	17.3	33.3	576.1
5.1-6.0	3	4.5	7.0	11.7	81.9	1	1.3	3.2	63.0	201.6	2	2.7	11.3	36.0	406.8
TOTALS	67	100	156.6 1/	--	502.2	78	100	249.9 1/	--	813.2	73	100	421.1 1/	--	1,537.5

* No stand averages summarized.
1/ Total acres of commercial type from land status records.

Table 3. Dwarf mistletoe-caused volume loss estimates for East Side Northern Region lodgepole pine stands.

Forest	Commercial 1/ Type M Acres	Infested 2/ %	Infested 2/ Acres	Volume Lost 3/ Ft^3/Acre/Year	Volume Lost 4/ Mft^3/Year
Beaverhead	406.5	52.4	213.0	6.1	1,291.2
Custer	42.5	28.2	12.0	8.8 5/	106.0
Deerlodge	482.7	46.6	224.9	11.1	2,499.2
Gallatin	156.6	42.0	65.8	7.6	502.2
Helena	249.9	35.4	88.5	9.2	813.2
Lewis & Clark	421.1	36.6	154.1	10.0	1,537.5
TOTAL	1,759.3		758.3		6,749.3

1/ From land status records
2/ From road survey (table 1)
3/ $\frac{\text{Volume loss}}{\text{Acres infested}}$
4/ Plot data
5/ Calculated East Side average. No Custer plots were infested.

LITERATURE CITED

Drummond, D.B. 1978. Approaches to determining volume losses due to dwarf mistletoe on a westwide basis. In: Dwarf mistletoe control through Forest management. Symp. Proc. Berkeley, CA. R. F. Scharpf and J. R. Parmeter, tech. coord. USDA-Forest Service Rep. PSW-31.

Hawksworth, F. G. 1977. The six class dwarf mistletoe rating system. USDA-Forest Service Gen. Tech. Rep. RM-48.

Edminster, C. B. 1978. RMYLD: Computation of yield tables for even-aged and two-aged stands. USDA-Forest Service Res. Pap. RM-199.

APPENDIX A

Calculated Growth Impact from Lodgepole Pine Dwarf Mistletoe on the Beaverhead National Forest

Plot	DMR 1/	Infested 10-year 2/ growth, ft^3	Healthy 10-year 2/ growth, ft^3	10-year difference ft^3	Annual difference ft^3
296	3.7	230	270	40	4
297	2.8	400	420	20	2
304	1.1	780	780	0	0
313	1.0	660	660	0	0
1299	4.6	90	500	410	41
1300	2.6	390	400	10	1
1304	2.0	100	100	0	0
1327	2.8	600	720	120	12
1329	1.0	260	260	0	0
1330	4.5	110	630	520	52
1331	0.3	590	590	0	0
1332	2.6	480	620	140	14
1334	3.4	250	300	50	5
1338	4.1	200	430	230	23
1339	2.6	660	860	200	20
1340	0.3	510	510	0	0
1341	3.8	300	400	100	10
1345	3.4	430	600	170	17
1349	0.2	2,270	2,270	0	0
2358	2.4	420	540	120	12
2368	3.2	320	450	130	13
2373	1.2	520	520	0	0
2375	3.0	340	420	80	8
2378	2.4	700	720	20	2
2381	0.6	320	320	0	0
2387	0.3	- 750	- 750	0	0
2391	0.8	290	290	0	0
2398	1.8	880	900	20	2
28				2,380	238

1/ 6-Class rating system
2/ From yield tables (see figures 3 and 4)

Calculated Growth Impact from Lodgepole Pine Dwarf Mistletoe
on the Deerlodge National Forest

Plot	DMR 1/	Infested 10-year 2/ growth, ft^3	Healthy 10-year 2/ growth, ft^3	10-year difference ft^3	Annual difference ft^3
3	4.1	450	830	380	38
13	0.9	210	220	10	1
14	4.0	210	380	170	17
16	1.3	520	520	0	0
23	1.4	1,470	1,480	10	1
27	3.0	800	830	30	3
46	0.5	1,430	1,430	0	0
120	2.2	460	460	0	0
122	2.4	790	900	110	11
123	5.0	40	120	80	8
126	3.1	820	980	160	16
129	0.3	830	830	0	0
132	5.0	130	460	330	33
1001	2.5	880	1,030	150	15
1003	4.1	380	940	560	56
1007	5.0	180	590	410	41
1014	0.1	1,130	1,130	0	0
1017	5.5	90	830	740	74
1020	4.4	250	610	360	36
1021	2.0	270	280	10	1
1025a	0.3	640	640	0	0
1025b	1.5	440	440	0	0
1026	2.7	760	940	180	18
1027	2.9	340	470	130	13
1035	0.3	1,450	1,450	0	0
1036	5.5	170	860	1,030	103
1038	0.9	1,600	1,600	0	0
1041	2.7	590	710	120	12
1045	2.1	580	640	60	6
1048	0.1	2,790	2,790	0	0
1050	5.0	- 230	300	530	53
1119	4.3	170	300	130	13
1121	5.2	50	360	310	31
1128	0.5	360	360	0	0
2001	1.0	670	670	0	0
2003	1.3	1,000	1,000	0	0
2009	4.7	100	190	90	9
2010	5.6	- 80	390	470	47
2026	2.4	640	760	120	12
2033	1.5	1,310	1,320	10	1
2035	2.5	240	240	0	0
2039	1.0	910	910	0	0
2042	1.9	760	770	10	1
2045	1.9	740	750	0	0
2056	0.4	550	550	0	0
2058	0.7	890	890	0	0
2144	0.1	1,170	1,170	0	0
2145	0.3	1,170	1,170	0	0
2153	0.1	- 70	- 70	0	0
2155	0.7	660	660	0	0
2156	1.0	690	710	20	2
51				6,730	673

1/ 6-Class rating system
2/ From yield tables (see figures 3 and 4)

APPENDIX C

Calculated Growth Impact from Lodgepole Pine Dwarf Mistletoe on the Gallatin National Forest

Plot	DMR 1/	Infested 10-year 2/ growth, ft^3	Healthy 10-year 2/ growth, ft^3	10-year difference ft^3	Annual difference ft^3
195	6.0	110	160	50	5
222	3.0	350	370	20	2
242	2.9	610	700	90	9
249	1.6	1,210	1,220	20	2
251	3.0	230	250	20	2
255	5.5	80	290	210	21
258	4.5	140	350	210	21
261	3.7	440	720	280	28
263	3.0	- 20	140	160	16
265	1.7	530	540	10	1
266	1.9	400	410	10	1
268	2.0	470	470	0	0
269	4.7	100	300	200	20
272	6.0	- 20	70	90	9
273	2.7	200	200	0	0
281	3.3	240	380	140	14
286	3.7	490	760	270	27
1232	4.2	320	470	150	15
Ø	1.6	220	220	0	0
1278	4.3	170	220	50	5
2295	3.0	190	240	50	5
2298	3.7	- 60	60	120	12
2306	3.0	130	130	0	0
23				2,150	215

1/ 6-Class rating system
2/ From yield tables (see figures 3 and 4)

APPENDIX D

Calculated Growth Impact from Lodgepole Pine Dwarf Mistletoe on the Helena National Forest

Plot	DMR 1/	Infested 10-year 2/ growth, ft^3	Healthy 10-year 2/ growth, ft^3	10-year difference ft^3	Annual difference ft^3
62	3.4	460	750	290	29
75	5.2	150	780	630	63
77	4.0	- 30	50	80	8
85	0.1	340	340	0	0
88	0.8	740	740	0	0
1053	1.1	970	970	0	0
1058	1.7	300	300	0	0
1061	1.2	550	550	0	0
1063	0.6	500	500	0	0
1067	3.2	620	870	250	25
1084	0.2	520	520	0	0
1087	3.6	360	490	130	13
1088	4.6	140	480	340	34
2061	0.2	520	520	0	0
2064	3.8	390	600	210	21
2068	0.8	500	500	0	0
2073	0.3	290	290	0	0
2080	0.8	450	450	0	0
2081	1.0	570	570	0	0
2086	1.6	650	650	0	0
2087	1.0	450	450	0	0
2089	3.0	190	250	60	6
2094	0.3	860	860	0	0
2102	0.2	540	540	0	0
2117	4.2	90	620	530	53
2181	0.7	210	210	0	0
26				2,570	257

1/ 6-Class rating system
2/ From yield tables (see figures 3 and 4)

APPENDIX E

Calculated Growth Impact from Lodgepole Pine Dwarf Mistletoe on the Lewis & Clark National Forest

Plot	DMR 1/	Infested 10-year 2/ growth, ft^3	Healthy 10-year 2/ growth, ft^3	10-year difference ft^3	Annual difference ft^3
141	2.8	260	320	60	6
143	4.0	60	440	380	38
161	4.7	80	360	280	28
166	3.8	160	210	50	5
168	1.6	270	270	0	0
184	6.0	- 170	280	450	45
190	0.5	440	440	0	0
1138	0.4	1,280	1,280	0	0
1145	0.4	630	630	0	0
1158	0.1	220	220	0	0
1166	4.8	40	250	210	21
1177	4.8	- 80	430	510	51
1202	5.2	100	370	270	27
1205	4.0	180	240	60	6
1207	0.4	550	550	0	0
1210	1.7	550	550	0	0
2186	1.3	220	220	0	0
2197	1.1	480	480	0	0
2205	0.5	540	540	0	0
2206	3.0	300	350	50	5
2208	0.7	460	460	0	0
2210	4.0	190	480	290	29
2215	4.0	90	170	80	8
2223	0.6	1,340	1,340	0	0
2227	1.0	270	270	0	0
2250	0.4	580	580	0	0
2251	0.3	280	280	0	0
27				2,690	269

1/ 6-Class rating system
2/ From yield tables (see figures 3 and 4)